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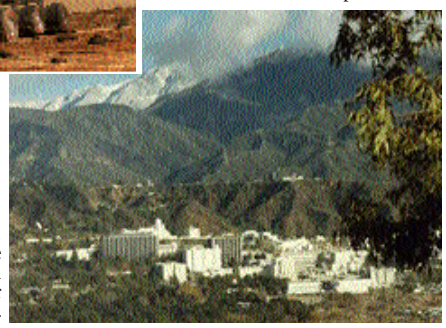
NASA-JPL
SSIC No. 9661

Jet Propulsion Laboratory

JPL: From 1936 to Today

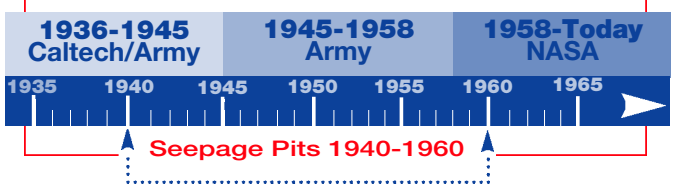
The Jet Propulsion Laboratory (JPL) near Pasadena, California was the site for testing some of the first rockets developed by the United States Army starting in 1936. Research and testing conducted by the California Institute of Technology (Caltech) for NASA at JPL since 1958 has increased our knowledge of the universe and has been used here on Earth in communications and medicine. Today, NASA JPL communicates with robotic spacecraft traveling to Mars and beaming messages from the Voyager spacecraft - the world's most distant travelers.

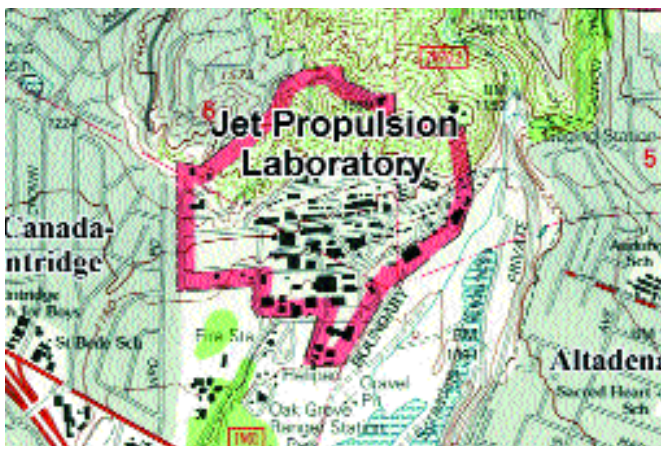
Robotics developed at JPL for NASA's Mars Rover help scientists understand climate and water on the planet Mars.



JPL is located on a 176-acre site in the foothills of the San Gabriel Mountains near Pasadena, California.

JPL Site History at a Glance





NASA is cleaning up chemicals disposed in the past that are found in soil and groundwater beneath and near JPL.

The work conducted at JPL over the years has involved the use of several chemicals. Currently, all chemical wastes from JPL activities are recycled or safely sent off-site to regulated treatment and disposal sites. In the past, liquid and solid wastes collected from some JPL laboratory drains and sinks were disposed in ground seepage pits - a waste management practice that was common in the 1940s and '50s. Unfortunately, some chemicals that were disposed of in the ground have been found in the soil and groundwater beneath JPL. A group of chemicals called volatile organic compounds (VOCs) and perchlorate have traveled underground to some nearby water supply wells, which have been turned off. NASA has been taking actions to address this problem and is committed to completing the cleanup. **We want you to know that Pasadena and Altadena water supply officials continue to provide safe, clean drinking water to people in their communities**.

What are these chemicals?

Volatile Organic Compounds (VOCs)
A group of chemicals that evaporate easily. VOCs have been widely used in industry, primarily as cleaning solvents. The US Environmental Protection Agency estimates VOCs are present in 1/5 of the nation's water supplies.

Perchlorate
A chemical that has been used as an ingredient in solid rocket fuel. It is also used to inflate air bags and in the manufacture of paint.

Some of these chemicals are of concern because at high enough levels of exposure they may cause health effects.

Addressing the Problem

In 1992, the JPL facility was placed on the National Priorities List (NPL) - the U.S. Environmental Protection Agency's list of highest priority sites for investigation and cleanup - and became regulated by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), sometimes referred to as *Superfund*.

CERCLA sets the framework for the investigation and cleanup of NPL sites and provides opportunities for public review and comment in the process. NASA is the lead federal agency and is responsible for selecting and implementing cleanup activities at the JPL site. Agencies providing oversight include:

- U.S. Environmental Protection Agency (EPA),
- California Department of Toxic Substances Control (DTSC), and
- California Regional Water Quality Control Board (RWQCB) Los Angeles Region

NASA is continuing to make progress throughout this rigorous process.

Public Meetings to discuss groundwater cleanup
January 27 & 28
See inside for time & place

VISIT OUR WEBSITE AT
http://JPLwater.nasa.gov

Read more about JPL cleanup activities

Comprehensive Environmental Response, Compensation & Liability Act

STEPS IN THE CERCLA PROCESS

Sites that have been put on the National Priorities List for cleanup must follow the CERCLA process. CERCLA requires that rigorous investigations and evaluations be carried out - often overlapping and usually requiring years of work before cleanup takes place. Steps in the CERCLA process are briefly described below. EPA's CERCLA terms appear in italics.

Site Is Discovered
Review facility records and past waste practices to see if further study is needed. *Site Discovery*

An Initial Look
Limited sampling and records review are done to identify chemicals. *Preliminary Assessment and Site Investigation*

Site Is Ranked
If it qualifies, site is placed on EPA's National Priorities Listing for cleanup. *National Priorities Listing*

A Full Investigation
In-depth sampling is done to identify type and extent of chemicals and how they might move in the environment. *Remedial Investigation*

Weighing Cleanup Options
Develop and evaluate options for cleanup. *Feasibility Study*

Proposed Cleanup
Publish cleanup plan and invite public comment. *Proposed Plan and Public Comment Period*

The Cleanup Plan
EPA-approved cleanup document is published. *Record of Decision*

Cleanup Begins
Cleanup system is designed and implemented. *Remedial Design/Remedial Action*

Cleanup Goals Are Met
Site is taken off the National Priorities List. *NPL De-Listing*

Checking Effectiveness
Routine checks to see that cleanup was effective. *Long-Term Monitoring/Review*

A Removal Action is a step that can be taken at any time during the CERCLA process to safeguard public health or the environment.

There are three types:

Emergency cleanup action that must start within hours or days

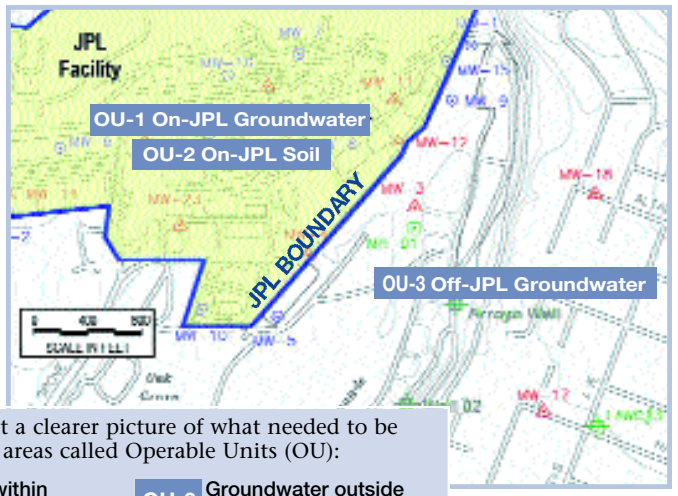
Time critical cleanup planning that can be done within 6 months

Non-time critical cleanup planning that can take longer than 6 months

For more information about CERCLA, please visit www.EPA.gov/superfund.

The Progress We've Made

NASA began by investigating and identifying the types and quantities of chemicals that were present, where the chemicals were coming from - referred to as the source - and how they could potentially move through the environment into soils and groundwater.

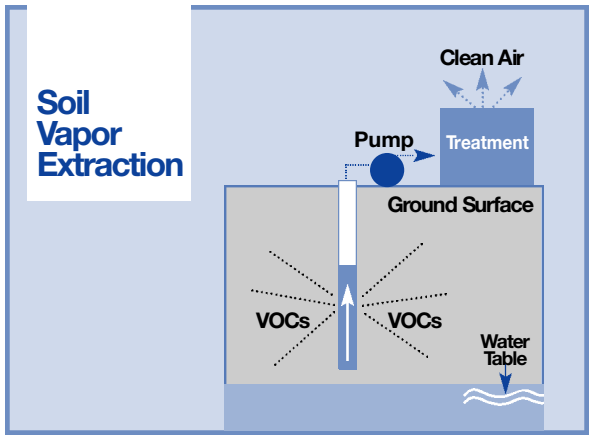


To better focus the site investigation and get a clearer picture of what needed to be done, NASA divided JPL into three separate areas called Operable Units (OU):

- **OU-1** Groundwater beneath JPL boundaries — On-JPL Groundwater
- **OU-2** Soil within JPL boundaries — On-JPL Soil
- **OU-3** Groundwater outside of JPL boundaries — Off-JPL Groundwater

On-JPL Soil Cleanup (OU-2)

Having completed detailed site investigations, NASA took steps to clean up the chemicals in soils to keep them from spreading to groundwater. In the late 1990s, NASA ran a small experiment or pilot test, using a technology called soil vapor extraction or SVE, to remove VOCs in soil. (See diagram). This test was so effective that NASA began using the technology on a wider area of chemicals in the ground - cleaning up more than 75% of the soil in the process. NASA proposed and received public input on using this technology as the final cleanup remedy for the On-JPL soils in 2002.



Soil Vapor Extraction Technology
A vacuum pulls air through the soil. Volatile chemicals (those that easily become vapor) evaporate and are drawn toward the extraction pipes so that the vapor can be filtered or treated before being released to the air.

NASA pilot-tested SVE technology to remove VOCs from soil at JPL.

Off-JPL Groundwater Cleanup (OU-3)

NASA wants to take an interim step to accelerate the cleanup process and is proposing a Removal Action to keep chemicals in water flowing beneath JPL from reaching more local water supply wells. This will have several benefits:

- Cleaning up both VOCs and perchlorate from groundwater,
- Allowing some City of Pasadena wells to resume operation,
- Keeping chemicals from spreading in groundwater.

Water supply officials continue to test, treat and provide safe drinking water.

After studying a number of cleanup alternatives, NASA is proposing to pump the water out of the ground and pipe it to a new treatment facility to remove the VOCs and perchlorate.

Removing VOCs

NASA is proposing to build a treatment facility that will remove VOCs from the water. As groundwater flows through this treatment system (called Liquid-phase Granular Activated Carbon), very porous carbon particles attract and accumulate VOCs where they can be collected and properly disposed.

Removing Perchlorate

NASA is proposing to use one of two systems that the State has conditionally accepted for drinking water.

▸Treatment Option One

This system, called Ion Exchange, runs groundwater through tanks filled with tiny resin (plastic) beads. When perchlorate touches the beads, perchlorate is exchanged with chloride and is extracted from the water.

▸Treatment Option Two

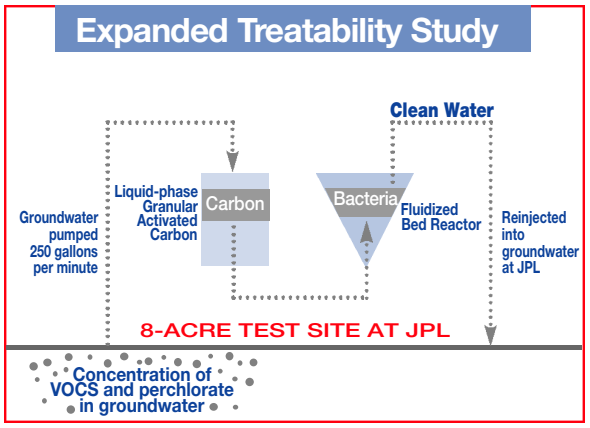
In this system, called Fluidized Bed Reactor, vertical tanks contain a bed of granular activated carbon. Added nutrients make naturally occurring bacteria multiply. As groundwater flows upward and through the bed, the bacteria destroy perchlorate.

Read More About It

Information on these technologies and NASA's proposed Removal Action will be summarized in an Action Memorandum and in more detail in the Engineering Evaluation/Cost Analysis (EE/CA). Once published, these and other documents will be made available on our website at http://JPLwater.nasa.gov and at the Information Repositories listed on the back page. At our Public Meetings we will be discussing the proposed Removal Action and choice of technologies and we also will announce the dates for public comment on these documents.

On-JPL Groundwater (OU-1)

NASA is conducting studies to find the right cleanup solution for the higher concentrations of chemicals found in groundwater beneath JPL. NASA has worked with water treatment specialists to run pilot tests at JPL and to evaluate several different treatment technologies. These experiments have all been small-scale investigations - pumping and treating relatively small amounts of groundwater from a localized area.



NASA will conduct an Expanded Treatability Study for removing VOCs and perchlorate from groundwater at JPL.

Expanded Treatability Study

NASA plans to take the technology that has been the most effective in pilot tests and conduct an Expanded Treatability Study in groundwater at JPL on 8 acres having the greatest concentration of VOCs and perchlorate. This study will allow NASA to collect data and modify the technologies - which have been used successfully at other sites - for the specific conditions found at JPL. NASA is planning on using Liquid-phase Granular Activated Carbon to remove VOCs, followed by a Fluidized Bed Reactor system to remove perchlorate (see descriptions in Off-JPL Groundwater section). While evaluating how these technologies will work on a large scale and in the long run, NASA will also be cleaning up a portion of groundwater on the site and preventing the further spread of chemicals in groundwater.

Here's How to Learn More

We recognize the importance of keeping people informed and providing opportunities to participate in the process. This update has been provided to give a brief description of NASA's plans for cleanup at the JPL site and the progress that we've made. We will continue to provide the public with more regular updates in a variety of ways in the coming months. Two Public Meetings will be held on January 27 and 28 (see places and times below), where we'll go into greater detail about NASA's proposed Removal Action for Off-JPL groundwater and the On-JPL Expanded Treatability Study. Please join us at these meetings. Also, let us know what you think about NASA's proposed Removal Action during the 30-day public comment period, which will be announced at the Public Meetings and on our website. We encourage you to visit our website at http://JPLwater.nasa.gov, and the Information Repositories listed on the back page.

For more information, contact

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OR

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Remedial Project Manager
818-393-6683

NASA Management Office
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Pasadena, CA 91109

PUBLIC MEETINGS TO BE HELD ON

TUESDAY, JANUARY 27, 7:30 p.m.
Charles W. Eliot Middle School
2184 N Lake Avenue, Altadena, CA 91001

WEDNESDAY, JANUARY 28, 7:30 p.m.
John Muir High School
1905 N Lincoln Avenue, Pasadena, CA 91103

DOORS TO EACH MEETING WILL OPEN AT 7:00 p.m.

For More Information

Documents on CERCLA and JPL cleanup activities are available for review at the following Information Repositories:

La Cañada Flintridge Public Library
4545 Oakwood Ave.
La Cañada Flintridge,
California 91011
818-790-3330

Pasadena Central Library
285 E. Walnut St.
Pasadena, California 91101
626-744-4052

Altadena Public Library
600 E. Mariposa Ave.
Altadena, California 91001
626-798-0833

JPL Repository
(JPL Employees Only)
4800 Oak Grove Dr.
Bldg. 111
818-354-4200

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4800 Oak Grove Drive
Pasadena, CA 91109

See inside for an update on JPL Cleanup Activities

JOIN US FOR TWO PUBLIC MEETINGS ON
NASA's proposed cleanup for Off-JPL groundwater

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